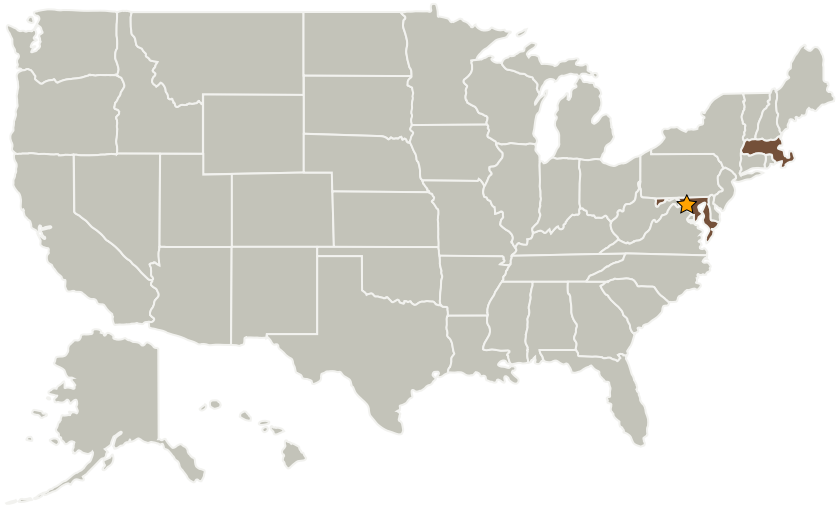
Highly Adaptive Primary Mirror Having Embedded Actuators, Sensors, and Neural Control, Phase II

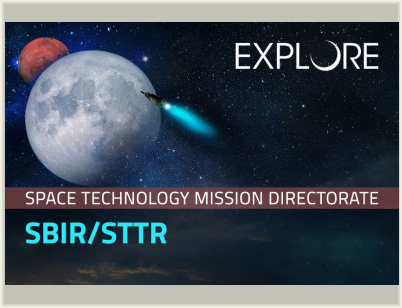
Completed Technology Project (2004 - 2006)

Project Introduction

Xinetics has demonstrated the technology required to fabricate a self-compensating highly adaptive silicon carbide primary mirror system having embedded actuators, sensors, and neural control with an areal density less that 10Kg/m2. The system architecture complete with feedback sensors, and neural algorithm was conceived, modeled and tested, and appears scaleable to 10-30meter class deployable systems. Highly adaptive telescopes require self-compensating telescope components to enable autonomously optimized optical trains to achieve very low total system wavefront error. High sensitivity semiconductor strain gages were shown to have adequate resolution for shape control. Resistance RTD sensors were shown to provide more than adequate temperature sensitivity. Analysis of strain gage placement conducted during this Phase I showed that the strain sensors required for neural control will require very high precision strain measurement (less than 1 microstrain), potential sensors were tested and characterized. Phase I data acquisition system limitations prevented full closed loop hardware demonstration. As a result Xinetics demonstrated the closed loop function using FEA analysis to provide simulated data to train the MATLAB based neural control algorithm. Phase I results show very encouraging performance and provide design information for a solid technical plan for full hardware demonstration in a phase II.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Xinetics, Inc.	Supporting Organization	Industry	Devens, Massachusetts

Primary U.S. Work Locations	
Maryland	Massachusetts

Project Transitions

December 2004: Project Start

December 2006: Closed out

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.2 Navigation Technologies
    - TX17.2.3 Navigation Sensors